Complete Summary

GUIDELINE TITLE

Risk assessment for and strategies to reduce perioperative pulmonary complications for patients undergoing noncardiothoracic surgery: a guideline from the American College of Physicians.

BIBLIOGRAPHIC SOURCE(S)

Qaseem A, Snow V, Fitterman N, Hornbake ER, Lawrence VA, Smetana GW, Weiss K, Owens DK, Aronson M, Barry P, Casey DE Jr, Cross JT Jr, Fitterman N, Sherif KD, Clinical Efficacy Assessment Subcommittee of the American College of Physicians. Risk assessment for and strategies to reduce perioperative pulmonary complications for patients undergoing noncardiothoracic surgery: a guideline from the American College of Physicians. Ann Intern Med 2006 Apr 18;144(8):575-80. [33 references] PubMed

GUIDELINE STATUS

This is the current release of the guideline.

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Perioperative pulmonary complications such as atelectasis, pneumonia, respiratory failure, and exacerbation of underlying chronic lung disease

GUIDELINE CATEGORY

Management
Prevention
Risk Assessment

CLINICAL SPECIALTY

Internal Medicine
Pulmonary Medicine
Surgery

INTENDED USERS

Physicians

GUIDELINE OBJECTIVE(S)

- To provide guidance to clinicians on clinical and laboratory predictors of perioperative pulmonary risk before noncardiothoracic surgery
- To evaluate the efficacy of strategies to reduce the risk for postoperative pulmonary complications

TARGET POPULATION

All adult persons undergoing noncardiothoracic surgery

INTERVENTIONS AND PRACTICES CONSIDERED

Risk Assessment

1. Assessment of patient-related risk factors such as chronic obstructive pulmonary disease, age older than 60 years, American Society of Anesthesiologists (ASA) class II or greater, functionally dependent, and congestive heart failure
2. Assessment of procedure-related risk factors such as prolonged surgery (>3 hours), abdominal surgery, thoracic surgery, neurosurgery, head and neck surgery, aortic aneurysm repair, emergency surgery, and general anesthesia
3. Measurement of serum albumin level

   Note: The following tests were considered but not routinely recommended: spirometry, chest radiographs, blood urea nitrogen, oropharyngeal culture

Management/Prevention

1. Risk reduction strategies:
   - Postoperative deep breathing exercise or incentive spirometry
   - Selective use of nasogastric tubes for postoperative nausea and vomiting after abdominal surgery
   - Note: The following strategies were considered but not recommended: preoperative smoking cessation, nutritional support, use of short-acting neuraxial blockade (versus long-acting agents), pulmonary artery catheterization.

MAJOR OUTCOMES CONSIDERED

- Rate of morbidity and mortality
- Incidence of pulmonary complications

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Note from the National Guideline Clearinghouse (NGC): The guideline is based on a 2-part systematic review prepared for the American College of Physicians (see "Companion Documents" field).

Preoperative Pulmonary Risk Stratification for Noncardiothoracic Surgery

The authors of the first background paper performed a MEDLINE search to identify relevant publications from 1 January 1980 through 30 June 2005. The authors used the following Medical Subject Heading (MeSH) terms and specified that they be the article's primary focus: intraoperative complications, postoperative complications, preoperative care, intraoperative care, and postoperative care, plus the text term perioperative complications in the title or abstract. Additional MeSH and text terms were identified by a review of the MEDLINE indexing for the retrieved articles. These included terms for pulmonary, respiratory, or cardiopulmonary diseases, conditions, or complications and terms for oxygenation and chest roentgenography. Additional searches were performed specific to preoperative chest radiography and preoperative spirometry. Additional references were identified by reviewing bibliographies of retrieved studies.

Only English-language publications were included and excluded were the publication types without primary data (that is, letters, editorials, case reports, conference proceedings, and narrative reviews). The authors excluded 1) studies with fewer than 25 participants per study group; 2) studies that used only administrative data (for example, International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM] codes) or lacked explicit criteria or definitions for pulmonary complications; 3) studies from developing countries (because of potential differences in respiratory and intensive care technology); 4) studies of ambulatory surgery; 5) studies of physiologic (for example, lung volumes and flow, oximetry) rather than clinical outcomes; 6) studies of gastric pH manipulation; 7) studies of complications unique to a particular type of surgery (for example, upper airway obstruction after uvulectomy); 8) studies of cardiopulmonary or pediatric surgery; and 9) studies of organ transplantation surgery (because of profoundly immunosuppressive drugs).

Strategies to Reduce Postoperative Pulmonary Complications after Noncardiothoracic Surgery

In addition to the literature search and selection criteria described above, a search for MeSH and text terms for pulmonary, respiratory, or cardiopulmonary conditions, complications, or care was performed for the second background paper. In addition, the authors performed additional focused searches for preoperative chest radiography and spirometry, laparoscopic versus open major abdominal operations, general versus spinal or epidural anesthesia, intraoperative neuromuscular blockade, postoperative pain management, and postoperative lung expansion techniques. Eligible studies were randomized, controlled trials; systematic reviews; or meta-analyses. The inclusion/exclusion criteria were the same as in the first background paper.

NUMBER OF SOURCE DOCUMENTS

Note from the National Guideline Clearinghouse (NGC): The guideline is based on a 2-part systematic review prepared for the American College of Physicians (see "Companion Documents" field).

Preoperative Pulmonary Risk Stratification for Noncardiothoracic Surgery

Of 16,959 citations identified by the literature search, 1223 citations were duplicates and 14,793 citations were not relevant by title and abstract review (refer to Figure 1 in the background paper [see "Companion Documents" field). Of the remaining 943 potentially relevant citations, 626 citations were excluded after review of the full publication and 145 citations were abstracted in detail.

Strategies to Reduce Postoperative Pulmonary Complications after Noncardiothoracic Surgery

The search and inclusion criteria identified 20 randomized clinical trials and 11 systematic reviews or meta-analyses.

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Note from the National Guideline Clearinghouse (NGC): The guideline is based on a 2-part systematic review prepared for the American College of Physicians (see "Companion Documents" field).

Preoperative Pulmonary Risk Stratification for Noncardiothoracic Surgery

The U.S. Preventive Services Task Force (USPSTF) criteria were used for assigning hierarchy of research design, grading a study's internal validity, and assigning summary strength of recommendation for each risk factor and laboratory test as follows.

A = good evidence to support the particular risk factor or laboratory predictor

B = at least fair evidence to support the particular risk factor or laboratory predictor

C = at least fair evidence to suggest that the particular factor is not a risk factor or that the laboratory test does not predict risk

D = good evidence to suggest that the particular factor is not a risk factor or that the laboratory test does not predict risk

I = insufficient evidence to determine whether the factor increases risk or whether the laboratory test predicts risk, and evidence is lacking, is of poor quality, or is conflicting

Strategies to Reduce Postoperative Pulmonary Complications after Noncardiothoracic Surgery

The Quality of Reporting of Meta-analyses (QUOROM) statement for reporting meta-analyses and the U.S. Preventive Services Task Force criteria for hierarchy of research design were used to assess internal validity and study quality (good, fair, or poor) and to make conclusions about strength of evidence as follows:

A = good evidence that the strategy reduces postoperative pulmonary complications and benefit outweighs harm

B = at least fair evidence that the strategy reduces postoperative pulmonary complications and benefit outweighs harm

C = at least fair evidence that the strategy may reduce postoperative pulmonary complications, but the balance between benefit and harm is too close to justify a general recommendation

D = at least fair evidence that the strategy does not reduce postoperative pulmonary complications or harm outweighs benefit

I = evidence of effectiveness of the strategy to reduce postoperative pulmonary complications is conflicting, of poor quality, lacking, or insufficient or the balance between benefit and harm cannot be determined.

METHODS USED TO ANALYZE THE EVIDENCE

Meta-Analysis
Review of Published Meta-Analyses
Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Note from the National Guideline Clearinghouse (NGC): The guideline is based on a 2-part systematic review prepared for the American College of Physicians (see "Companion Documents" field).

Assessing Study Quality

The U.S. Preventive Services Task Force (USPSTF) criteria were used for assigning hierarchy of research design, grading a study's internal validity, and assigning summary strength of recommendation for each risk factor and laboratory test.

Statistical Analysis

The literature search yielded primarily unadjusted estimates for most laboratory factors of interest. Limited multivariable, adjusted studies were available for serum albumin level less than 30 g/L and elevated blood urea nitrogen level. However, rather than attempt to compute potentially biased summary estimates, the authors provided narrative descriptions of the pattern of results for these potential risk factors.

The eligible multivariable risk factor studies varied considerably in the number and type of competing risks and confounders included in the analyses. Extensive use of prescreening methods and variable selection algorithms often limited reporting to the subset of risk factors that were determined to be statistically significant in a given sample. The result is a subtle form of publication bias, which was verified by examination of the funnel plots and trim-and-fill estimates for each risk factor.

Odds ratios from each study were extracted, along with their respective standard errors, 95% confidence limits, or both. The authors used the I^2 statistic and the Cochran Q statistic to assess study heterogeneity. They also recomputed pooled estimates with and without studies that produced extreme results. An I^2 statistic of 50% or more indicates substantial heterogeneity among study estimates. The DerSimonian-Laird method was used to compute random-effects estimates when the set of studies was heterogeneous. In cases where 3 or more studies contributed estimates for a risk factor, the trim-and-fill method was used to adjust pooled estimates of a risk factor's effect on postoperative pulmonary complications for publication bias. Trim-and-fill estimates check the sensitivity of pooled estimates to potential publication bias. The authors used meta-analysis procedures available in Stata software, version 8 (Stata Corp., College Station, Texas), to conduct these analyses.

Strategies to Reduce Postoperative Pulmonary Complications after Noncardiothoracic Surgery

Assessment of Study Quality

The Quality of Reporting of Meta-analyses (QUOROM) statement for reporting meta-analyses and the U.S. Preventive Services Task Force criteria for hierarchy of research design were used to assess internal validity and study quality (good, fair, or poor) and to make conclusions about strength of evidence.

Statistical Analysis

Simple means and chi-square tests were used to calculate confidence intervals and P values when they were not provided in publications. The authors did not perform quantitative pooling because multiple meta-analyses were beyond the

scope of a broad review of multiple potential interventions. The authors reported pooled results from previous meta-analyses when applicable.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

Preoperative Pulmonary Risk Stratification for Noncardiothoracic Surgery

An economic evaluation found that estimated annual real costs for preoperative spirometry are $25 million to $45 million in 1991 U.S. dollars. If use of spirometry were reduced to meet current guidelines, potential savings to third-party payers would range from $29 million to $111 million.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

This guideline was approved by the American College of Physicians (ACP) Board of Regents in 21 January 2006.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Recommendation 1: All patients undergoing noncardiothoracic surgery should be evaluated for the presence of the following significant risk factors for postoperative pulmonary complications in order to receive pre- and postoperative interventions to reduce pulmonary risk: chronic obstructive pulmonary disease, age older than 60 years, American Society of Anesthesiologists (ASA) class of II or greater, functionally dependent, and congestive heart failure.

The following are not significant risk factors for postoperative pulmonary complications: obesity and mild or moderate asthma.

Recommendation 2: Patients undergoing the following procedures are at higher risk for postoperative pulmonary complications and should be evaluated for other

concomitant risk factors and receive pre- and postoperative interventions to reduce pulmonary complications: prolonged surgery (>3 hours), abdominal surgery, thoracic surgery, neurosurgery, head and neck surgery, vascular surgery, aortic aneurysm repair, emergency surgery, and general anesthesia.

Recommendation 3: A low serum albumin level (<35 g/L) is a powerful marker of increased risk for postoperative pulmonary complications and should be measured in all patients who are clinically suspected of having hypoalbuminemia; measurement should be considered in patients with 1 or more risk factors for perioperative pulmonary complications.

Recommendation 4: All patients who after preoperative evaluation are found to be at higher risk for postoperative pulmonary complications should receive the following postoperative procedures in order to reduce postoperative pulmonary complications: 1) deep breathing exercises or incentive spirometry and 2) selective use of a nasogastric tube (as needed for postoperative nausea or vomiting, inability to tolerate oral intake, or symptomatic abdominal distention).

Recommendation 5: Preoperative spirometry and chest radiography should not be used routinely for predicting risk for postoperative pulmonary complications.

Preoperative pulmonary function testing or chest radiography may be appropriate in patients with a previous diagnosis of chronic obstructive pulmonary disease or asthma.

Recommendation 6: The following procedures should not be used solely for reducing postoperative pulmonary complication risk: 1) right-heart catheterization and 2) total parenteral nutrition or total enteral nutrition (for patients who are malnourished or have low serum albumin levels).

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of evidence supporting the recommendations is not specifically stated.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

- Appropriate pulmonary risk stratification for noncardiothoracic surgery
- Use of appropriate strategies to reduce the risk for postoperative pulmonary complications

POTENTIAL HARMS

Not stated

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

Clinical practice guidelines are "guides" only and may not apply to all patients and all clinical situations. Thus, they are not intended to override clinicians' judgment. All American College of Physicians (ACP) clinical practice guidelines are considered automatically withdrawn or invalid 5 years after publication, or once an update has been issued.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

IMPLEMENTATION TOOLS

Patient Resources

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Staying Healthy

IOM DOMAIN

Effectiveness
Patient-centeredness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Qaseem A, Snow V, Fitterman N, Hornbake ER, Lawrence VA, Smetana GW, Weiss K, Owens DK, Aronson M, Barry P, Casey DE Jr, Cross JT Jr, Fitterman N, Sherif KD, Clinical Efficacy Assessment Subcommittee of the American College of Physicians. Risk assessment for and strategies to reduce perioperative pulmonary complications for patients undergoing noncardiothoracic surgery: a guideline from the American College of Physicians. Ann Intern Med 2006 Apr 18;144(8):575-80. [33 references] PubMed

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2006 Apr 18

GUIDELINE DEVELOPER(S)

American College of Physicians - Medical Specialty Society

SOURCE(S) OF FUNDING

American College of Physicians

GUIDELINE COMMITTEE

Clinical Efficacy Assessment Subcommittee (CEAS)

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Stock ownership or options (other than mutual funds): G.W. Smetana (SafeMed Harvard Imaging)

Other: G.W. Smetana (Novartis Pharma Schweiz)

GUIDELINE STATUS

This is the current release of the guideline.

GUIDELINE AVAILABILITY

Electronic copies: Available from the Annals of Internal Medicine Web site.

Print copies: Available from the American College of Physicians (ACP), 190 N. Independence Mall West, Philadelphia PA 19106-1572.

AVAILABILITY OF COMPANION DOCUMENTS

The following are available:

- Smetana, GW; Lawrence, VA ; Cornell, JE. Preoperative pulmonary risk stratification for noncardiothoracic surgery: systematic review for the American College of Physicians. Ann Intern Med. 2006 Apr 18;144(8):581-95. Electronic copies: Available from the Annals of Internal Medicine Web site.
- Lawrence, VA; Cornell, JE; Smetana, GW. Strategies to reduce postoperative pulmonary complications after noncardiothoracic surgery: systematic review for the American College of Physicians. Ann Intern Med. 2006 Apr 18;144(8):596-608. Electronic copies: Available from the Annals of Internal Medicine Web site.

Print copies: Available from the American College of Physicians (ACP), 190 N. Independence Mall West, Philadelphia PA 19106-1572.

PATIENT RESOURCES

The following is available:

- Summaries for patients. Risk for and reduction of pulmonary complications in patients undergoing noncardiothoracic surgery: an American College of Physicians guideline. Ann Intern Med 2006 Apr 18;144(8):I-40. Electronic copies: Available from the Annals of Internal Medicine Web site.

Print copies: Available from the American College of Physicians (ACP), 190 N. Independence Mall West, Philadelphia PA 19106-1572.

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NGC STATUS

This NGC summary was completed by ECRI on May 17, 2006. The information was verified by the guideline developer on June 8, 2006.

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